

# PATENT SPECIFICATION

(11) 1 605 408

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- (21) Application No. 60055/73 (22) Filed 20 December 1974  
 (31) Provisional Application No. 60055/73 (32) Filed 28 December 1973  
 (44) Complete Specification published 5 June 1996 (19)  
 (51) Int. Cl<sup>6</sup> E04C 3/00  
 (52) Index at acceptance

E1D DCA D1074 D402 D533



(72) Inventor William Lancaster Ostle  
 (54) TUBULAR STRUCTURAL ELEMENT

We, High Duty Alloys Limited, A British Company of 89, Buckingham Avenue, Trading Estate, Slough, Buckinghamshire do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:-

The invention relates to a tubular structural element particularly, but not exclusively, for use in forming a honeycomb-like container which can contain a number of objects where circumstances demand a separate layer of material between the said objects.

It is known to produce such containers by assembling together a plurality of similar structural elements to form a "honeycomb", the elements being extruded metal sections and being welded together to form a plurality of separate cells. The known sections however suffer from various disadvantages associated with manufacturing tolerances, excessive need for welding, uneconomic use of material, the formation of an unsymmetrical cell structure, expensive processing to remove distortion and so on.

It is an object of the invention to provide a tubular structural element for use in forming "honeycomb" containers which mitigates against the disadvantages mentioned above.

According to the invention there is provided a tubular structural element which is substantially square in cross-section, the structural element having at each corner an outer abutment face for abutment in use against a corresponding face of a like element, each abutment face being inclined at an angle of 45° to the planes of the major external faces of the structural element adjacent thereto, the line of intersection of the said planes being co-incident with the abutment face.

The structural element is preferably of constant cross-section and constant wall thickness and may be manufactured by forming a drawbench from extruded round tubing. The structural element may be made of aluminium alloy.

The line of intersection is preferably co-incident with the longitudinal centre-line of the abutment face. In a preferred arrangement the lateral extremities of the major faces are bordered by outwardly bulged regions which

advantageously extend generally parallel with the associated major face, the two outwardly bulged regions at each corner having an abutment face disposed therebetween.

From another aspect the invention is a "honeycomb" structure comprising a plurality of tubular structural elements as described above connected together at their abutment faces.

The invention is diagrammatically illustrated, by way of example, in the accompanying drawing which is a cross-sectional end elevation of a tubular structural element.

In the drawing there is shown a tubular structural element 1 which is substantially square in cross-section, the element 1 having been formed on a drawbench from extruded aluminium alloy tubing. At each corner the element 1 is formed with outwardly bulged portions 2 the major parts of which extend in planes parallel with the major external faces 3 of the element. The portions 2 border each face 3 and thus a pair of portions 2 is provided at each corner. Between each pair of the portions 2 is disposed an abutment region having a face 4 which is inclined at an angle of 45° with respect to the major faces 3 adjacent thereto, the longitudinal centre-line of the abutment face 4 being co-incident with the line of intersection of the planes of the said adjacent major faces. It will be noted that the wall thickness of the element 1 is substantially constant.

In use a plurality of elements 1 will be joined by welding their respective abutment faces together to form a "honeycomb" structure composed of a series of substantially identical cells, the wall thickness of which is substantially uniform. The abutment faces are preferably as narrow as possible within the limits imposed by the need to provide large enough mating surfaces to weld to adjacent elements while allowing for deviations due to longitudinal or lateral bow in the elements.

What we claim is:-

1. A tubular structural element which is substantially square in cross-section, the structural element having at each corner an outer abutment face for abutment in use against a corresponding face of a like element, each abutment face being inclined at an angle of 45°

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The invention relates to a tubular structural element particularly, but not exclusively, for use in forming a honeycomb-like container which can contain a number of objects where circumstances demand a separate layer of material between the said objects.

It is known to produce such containers by assembling together a plurality of similar structural elements to form a "honeycomb", the elements being extruded metal sections and being welded together to form a plurality of separate cells. The known sections however suffer from various disadvantages associated with manufacturing tolerances, excessive need for welding, uneconomic use of material, the formation of an unsymmetrical cell structure, expensive processing to remove distortion and so on.

It is an object of the invention to provide a tubular structural element for use in forming "honeycomb" containers which mitigates against the disadvantages mentioned above.

According to the invention there is provided a tubular structural element which is substantially square in cross-section, the structural element having at each corner an outer abutment face for abutment in use against a corresponding face of a like element, each abutment face being inclined at an angle of 45° to the planes of the major external faces of the structural element adjacent thereto, the line of intersection of the said planes being co-incident with the abutment face.

The structural element is preferably of constant cross-section and constant wall thickness and may be manufactured by forming a drawbench from extruded round tubing. The structural element may be made of aluminium alloy.

The line of intersection is preferably co-incident with the longitudinal centre-line of the abutment face. In a preferred arrangement the lateral extremities of the major faces are bordered by outwardly bulged regions which

advantageously extend generally parallel with the associated major face, the two outwardly bulged regions at each corner having an abutment face disposed therebetween.

From another aspect the invention is a "honeycomb" structure comprising a plurality of tubular structural elements as described above connected together at their abutment faces.

The invention is diagrammatically illustrated, by way of example, in the accompanying drawing which is a cross-sectional end elevation of a tubular structural element.

In the drawing there is shown a tubular structural element 1 which is substantially square in cross-section, the element 1 having been formed on a drawbench from extruded aluminium alloy tubing. At each corner the element 1 is formed with outwardly bulged portions 2 the major parts of which extend in planes parallel with the major external faces 3 of the element. The portions 2 border each face 3 and thus a pair of portions 2 is provided at each corner. Between each pair of the portions 2 is disposed an abutment region having a face 4 which is inclined at an angle of 45° with respect to the major faces 3 adjacent thereto, the longitudinal centre-line of the abutment face 4 being co-incident with the line of intersection of the planes of the said adjacent major faces. It will be noted that the wall thickness of the element 1 is substantially constant.

In use a plurality of elements 1 will be joined by welding their respective abutment faces together to form a "honeycomb" structure composed of a series of substantially identical cells, the wall thickness of which is substantially uniform. The abutment faces are preferably as narrow as possible within the limits imposed by the need to provide large enough mating surfaces to weld to adjacent elements while allowing for deviations due to longitudinal or lateral bow in the elements.

What we claim is:-

1. A tubular structural element which is substantially square in cross-section, the structural element having at each corner an outer abutment face for abutment in use against a corresponding face of a like element, each abutment face being inclined at an angle of 45°

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- to the planes of the major external faces of the structural element adjacent thereto, the line of intersection of the said planes being co-incident with the abutment face.
- 5     2. An element according to claim 1 which is of constant cross-section and constant wall thickness.
- 10    3. An element according to claim 2 manufactured by forming on a drawbench from extruded round tubing.
- 15    4. An element according to any preceding claim made of aluminium alloy.
5. An element according to any preceding claim wherein the line of intersection is co-incident with the longitudinal centre-line of the abutment face.
6. An element according to any preceding claim wherein the lateral extremities of the major faces are bordered by outwardly bulged regions, the two outwardly bulged regions at each corner having an abutment face disposed therebetween. 20
7. An element according to claim 6 wherein the outwardly bulged regions extend generally parallel with the associated major face.
8. A tubular structural element substantially as hereinbefore described with reference to and as shown in the accompanying drawing. 25
9. A "honeycomb" structure comprising a plurality of tubular structural elements according to any preceding claim connected together at their abutment faces. 30

Printed by Microgen Current Knowledge, Wokingham RG41 2QY. 1996

Typeset by Document Design, Wokingham. RG11 1BJ.

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5. 2. An element according to claim 1 which is of constant cross-section and constant wall thickness.
10. 3. An element according to claim 2 manufactured by forming on a drawbench from extruded round tubing.
4. An element according to any preceding claim made of aluminium alloy.
15. 5. An element according to any preceding claim wherein the line of intersection is co-incident with the longitudinal centre-line of the abutment face.
6. An element according to any preceding claim wherein the lateral extremities of the major faces are bordered by outwardly bulged regions, the two outwardly bulged regions at each corner having an abutment face disposed therebetween. 20
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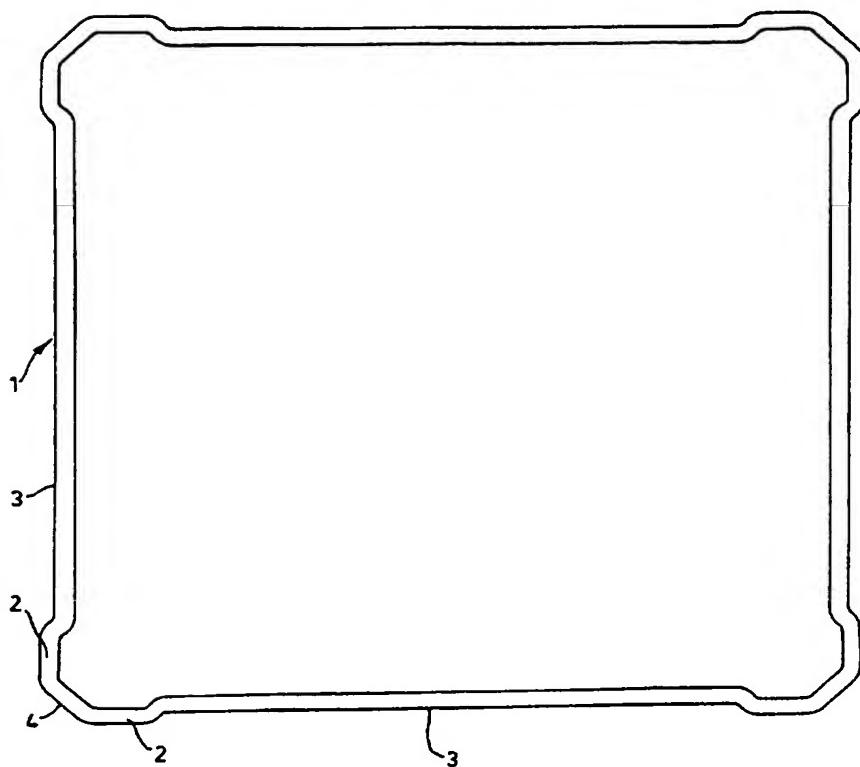
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the Original on a reduced scale*

**Sheet 1**



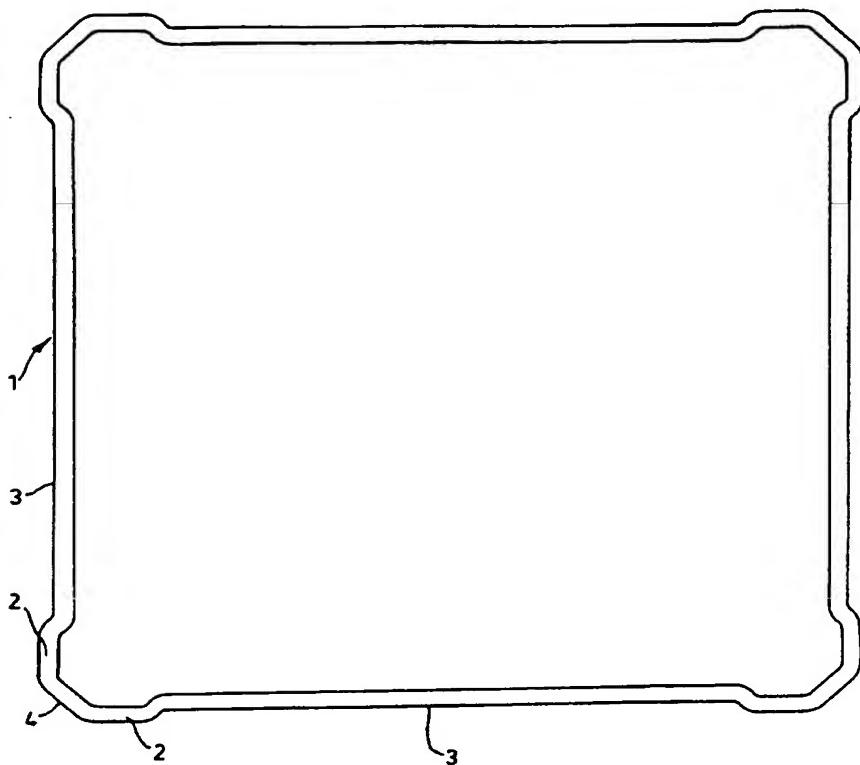
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Sheet 1



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